

REMARKS:

Claims 1-16 are in the case and presented for consideration.

In a response dated January 15, 2004, applicants amended the title of the invention to better indicate the nature of the invention. In particular, the cooperative nature of the agents is important to the operation of the system and method to produce results in a time-efficient manner. The title was objected to because of the addition of the term "cooperative," which the Office believes to be new matter.

Applicants respectfully disagree with the Office for the following reasons. In the Field and Background Of The Invention section (paragraph 2), the specification introduces that this invention relates generally to the field of distributed decision problem solving. In paragraph 19, the specification expands that distributed problem solving is a problem solving method in which a cooperative solution to a problem is generated by loosely coupled agents. Thus, applicants expressly disclosed the cooperative nature of the claimed invention.

Cooperative algorithms were described in the specification in the set of six unique coordination schemes described in paragraphs 59 through 67. In these local, joint, pool, elite local, elite joint, and elite pool, the next solution/iterate is selected by the process of a mutual cooperation among the nodes. In each of these coordination schemes, there is a set of solutions {x_g} that is produced by splicing the decisions from each of the nodes.

One skilled in the art would understand that this splicing is impossible without the cooperation among computational entities in the nodes.

The examiner has also argued in the Office Action that although the specification indicates that coevolutionary agents are spread among several nodes (see paragraph 49), nodes, as defined by the applicants, do not produce a cooperative search. The constituents of a node have been described with great deal in the specification. One

skilled in the art would understand from the specification, as a whole, that the words "search by nodes" were used as a shorthand for the underlying algorithm operations since the specification expressly discloses that the algorithms are embodied in the agents, and the agents are spread among the nodes. For example, paragraph 34 and 35 in the Summary of the Invention section of the specification describe the sole objects of the invention as follows:

It is an object of the present invention to provide a new method and architecture for solving complex problems using a class of efficient and scalable algorithms in a distributed network environment.

It is a further object of the invention to provide a method and system for solving problems using coevolutionary algorithms in a distributed network having multiple nodes in which a solution to a given problem can be obtained from any node in the system. (Emphasis Added)

Paragraph 45 states that multiple coevolutionary agents 30a-30d are spread among nodes 20a-20d. Paragraph 52 states,

"The coevolutionary algorithms embodied in coevolutionary agents 30a-30d have no direct means..." (Emphasis added).

Paragraph 50 states that:

"each evolutionary agent 30a-30d implements a local evolutionary algorithm that searches over the subspace corresponding to locally available information."

Thus, one skilled in the art would understand from the specification that algorithms are used in a network having nodes. The cooperative search referred to in paragraph 49 is clearly accomplished by coevolutionary algorithms embodied in coevolutionary agents spread among a distributed network of nodes 20a-20d. The Office's interpretation of the

phrase "search by nodes" is inconsistent with the description of nodes and cooperative algorithms as described consistently elsewhere in the specification. In light of the confusion however, applicants have amended the specification to clarify the intended meaning of the phrase. No new matter has been added since the newly added material is expressly described in the specification.

Also, it is noted that an "original claim," or a claim that is contained in the specification as filed, complies with the section 112 invention description requirement, and such "original claims" constitute their own description. *In re Koller*, 613 F.2d 819, 823-824, 204 USPQ 702, 706 (CCPA 1980). Claim 1 of the "original claims" of the present invention recites the following limitations:

- 1) providing an optimization algorithm;
- 2) creating a plurality of coevolutionary agents implementing the optimization algorithm;
- 3) the plurality of coevolutionary agents distributed across the at least two nodes in the network architecture; and
- 4) conducting concurrent local searches using each coevolutionary agent at the corresponding one of the nodes.

Thus, one skilled in the art would understand from the original claim 1, that the words "search by nodes" in paragraph 49 were used as a shorthand for the underlying algorithm operations since the original claim 1 expressly discloses that the algorithms are implemented by the agents, and the agents are distributed among the nodes. Original claim 1 also supports the amendment to the specification above, since it is well-settled that conforming the specification to matter disclosed in the original claims is permissible. *In re Benno*, 768 F.2d 1340, 1346, 226 USPQ 683, 686-687 (Fed. Cir. 1985).

Furthermore, applicants defined "Coevolutionary algorithms" in paragraph 13, indicating that "Coevolutionary algorithms are distributed and consist of distinct distributed algorithm components that considered together follow various models of cooperation or competition. Based on the arguments made above, it is clear that applicants intended to disclose a model of cooperation. The Office's objection is meritless since the specification and "original claims" expressly explain the relationship between the coevolutionary algorithms, coevolutionary agents, nodes, and the cooperative searching described in paragraph 49.

Claims 1-16 were rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Office states that applicants are silent on "cooperative coevolutionary agents," with the exception of paragraph 49.

The term "cooperative" has been removed from the phrase "cooperative coevolutionary agents." However, the term "cooperative" has been added to other portions of the claims. The claims as amended comply with the written description requirement.

As explained above, not only is it clearly stated that the invention is related to distributed decision problem solving, which is a method in which a cooperative solution is generated by agents, but a cooperative search is discussed in paragraph 49, which is clearly accomplished by coevolutionary algorithms embodied in coevolutionary agents (30a-30d) spread among a distributed network of nodes (20a-20d).

Furthermore, applicants give an extensive and detailed explanation of how cooperative coevolutionary agents are programmed with algorithms and swap information between nodes according to one of six schemes described in paragraphs 59 through 67.

Thus, applicants believe that the examples and descriptions given in the specification, especially in light of applicants reference to prior art theories of cooperative solutions based on the teachings of Potter and Lesser (see paragraphs 16 and 22-23), reasonably convey to one skilled in the art possession of the claimed invention as it pertains to cooperative solutions and cooperative searching as now claimed.

Claims 1-16 were rejected pursuant to 35 U.S.C. §102 as anticipated by the disclosure contained in an IEEE Proceedings article naming F. Seredynski as the author ("Seredynski").

Claims 1 and 5 have been amended and now recite "coevolutionary agents implementing the optimization algorithm to provide a cooperative solution" as well as the step of "conducting concurrent and cooperative local searches using each coevolutionary agent at the corresponding one of the nodes."

Also, claims 9-16 seek protection for a system embodying the method recited in claims 1-8. Claim 9 has been amended to recite "coevolutionary agent means for implementing an optimization algorithm to provide a cooperative solution" and "search means for conducting concurrent and cooperative local searches using each coevolutionary agent means." Changes were also made to correct antecedent basis.

Claim 13 has been amended to recite "coevolutionary agents implementing the optimization algorithm for providing a cooperative solution," and "search means for conducting concurrent and cooperative local searches using each coevolutionary agent at the corresponding one of the nodes." No new matter has been added since the relationship between coevolutionary algorithms, coevolutionary agents, nodes, and the cooperative searching in paragraph 49 was expressly and clearly described in the specification.

Applicants respectfully submit that all of claims 1-16 are patentable over the Seredynski reference, as well as the other references of record in this case.

Applicants submit that the method and system of Seredynski utilizes **competitive** approaches (see p. 432, col. 2, lines 16-21) rather than providing a **cooperative** solution to an optimization or complex problem and **cooperative** searching by using each coevolutionary agent at the corresponding nodes as recited in claims 1, 5, 9, and 13 of applicants' invention. Seredynski notes that others have proposed cooperative approaches, but he discards cooperative approaches as unacceptable compared to the competitive approach described in the article. See p. 432, col. 2, text following heading B.

Applicants further reiterate that in claims 4, 8, 11, 12, 15 and 16, specific schemes for coordinating the actions of the mobile agents are recited. None of these schemes are disclosed in Seredynski; the section of Seredynski that the Office has referenced (pg. 432, col. 2, lines 3-10) does not mention any one of these schemes. The Office has only responded that "Seredynski anticipates the applicants invention." The Office has not responded to applicants assertions that the claimed schemes are not disclosed. Applicants invite the Office to point out with specificity (not just by page, column, and lines) the schemes that the Office believes anticipate the claimed schemes.

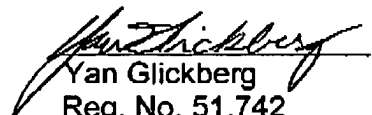
Finally, applicants submit that Seredynski fails to teach or suggest the recited limitation in claims 1, 5, 9 and 13 of conducting concurrent and cooperative local searches for producing local solutions using information available from the corresponding one of the local databases. Use of information from local databases is not disclosed at any of the sections which the examiner has cited. Again, applicants invite the Office to point out with specificity (not just by page, column, and lines) the local solutions produced and the local databases used in Seredynski.

Accordingly, the application and claims are believed to be in condition for allowance, and favorable action is respectfully requested. No new matter has been added.

If any issues remain which may be resolved by telephonic communication, the Examiner is respectfully invited to contact the undersigned at the number below, if such will advance the application to allowance.

Favorable action is respectfully requested.

Respectfully submitted,


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